



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/561,581

12/19/2005

Manuel Gaudon

355901-1860

6470

38706

7590

11/25/2008

FOLEY & LARDNER LLP  
975 PAGE MILL ROAD  
PALO ALTO, CA 94304

EXAMINER

EMPIE, NATHAN H

ART UNIT

PAPER NUMBER

1792

MAIL DATE

DELIVERY MODE

11/25/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/561,581	<b>Applicant(s)</b> GAUDON ET AL.	
	<b>Examiner</b> NATHAN H. EMPIE	<b>Art Unit</b> 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 01 September 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>9/1/06</u> .  | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

Examiner acknowledges receipt of 12/19/05 preliminary amendment to the specification and claims which was entered into the file. Claims 1-28 are currently pending.

#### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 11 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 11 contains the trademark/trade name MELIORAN ®. Where a trademark or trade name is used in a claim as a limitation to identify or describe a particular material or product, the claim does not comply with the requirements of 35 U.S.C. 112, second paragraph. See *Ex parte Simpson*, 218 USPQ 1020 (Bd. App. 1982). The claim scope is uncertain since the trademark or trade name cannot be used properly to identify any particular material or product. A trademark or trade name is used to identify a source of goods, and not the goods themselves. Thus, a trademark or trade name does not identify or describe the goods associated with the trademark or trade name. In the present case, the trademark/trade name is used to identify/describe a particular chemistry of a phosphate ester and, accordingly, the identification/description is indefinite.

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-7, 9-10, 13, 19-23, 25 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nonninger et al (WO 02/086194, as supplied by applicant's IDS, the examiner will be making references in regard to English equivalent US 2004/0115416 A1; hereafter Nonninger), in view of Mukherjee et al. ("Correlation Between Slurry Rheology, Green Density, and Sintered Density of Tape Cast Yttria Stabilized Zirconia" *Ceramics International* 27 (2001) 731-739; hereafter Mukherjee) and Bitterlich et al. ("Rheological Characterization of Water-Based Slurries for the Tape Casting Process" *Ceramics International* 28 (2002) 675-683).

3. Nonninger teaches a method of preparing a metal oxide layer on a substrate (see, for example, abstract), in which the following successive steps are carried out:

4. a metal oxide powder (see, for example, [0012-0013], preferably a ysz is taught) is dispersed in a liquid medium comprising a dispersion solvent (see, for example, [0020], such as water) and a dispersant (see, for example, [0019]), the said liquid medium containing neither plasticizer nor binder, by means of which a suspension A of the said metal oxide powder in the said liquid medium is obtained (see, for example, in [0029] wherein YSZ particles, and a dispersant are first mixed prior to subsequent polymer additive additions);

Art Unit: 1792

5. at least one polymer is added to the suspension A, obtaining suspension B (see, for example, further polymeric additives ([0016], [0029], [0031]) being added after mixing suspension A (see, for example, [0029], [0031]).

6. suspension B is deposited on the substrate by a dip coating method by means of which a green layer is obtained (see, for example, [0009], [0011], [0029], [0031]),

7. the green layer is dried and calcined (see, for example, [0011], [0029], [0031])

8. Nonninger does not explicitly teach wherein the polymer added to suspension A is in a solution with a solvent, and Nonninger does not explicitly teach wherein in all situations the polymer is added separately and following to the dispersant. Mukherjee teaches a method of making ceramic layers (specifically YSZ) via wet chemical suspension routes (see, for example, abstract). Mukherjee further teaches that it is well known in the art that the sequence of adding additives to a suspension is critical, namely the dispersant has to be added before the other polymeric additives properly break down any agglomerates generating a proper dispersion (pg 732). Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have added the polymer / binder species subsequent to the dispersant, as taught by Mukherjee, to avoid competitive adsorption and break down any agglomerates in the method of Nonninger. Bitterlich teaches a method of making stable ceramic suspensions (specifically for t-YSZ, pg 676) for coating processes (see, for example, abstract, pg 675-676), which further involve a two step mixing process wherein the powder / solvent / dispersant are first prepared and mixed, and then solution of a polymer (binder) / solvent are added to the first mixture (see, for example, pg 676-677).

Art Unit: 1792

Bitterlich teaches that it is well known in the art to provide a binder with a solvent to predictably add a binder to suspension (see, for example, pg 676-677). As both Nonninger and Bitterlich teach methods wherein a polymeric / binder addition is applied following dispersant addition, and as both are directed to methods of forming films of ceramic (specifically yttrium stabilized zirconia) would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated the polymer / binder in a solution with a solvent as the means to introduce the polymer / binder in the method of Nonninger in view of Mukherjee, as Bitterlich has taught that polymeric additives can predictably be incorporated into dispersions with a solvent, and as one of ordinary skill in the art would appreciate that additions of solvent can be used to control the viscosity and mixing behavior of the suspension.

9. Claims 2 and 3: Nonninger further teaches wherein the oxide layer has a thickness of between 100 nm and 10 microns (see, for example, [0023]). Although Nonninger does not explicitly teach the oxide layer having a thickness of 1 to 100, or 1 to 10 microns, it would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated such a claimed thickness since in the case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

10. Claim 4: Nonninger further teaches a variety of metal oxides, including simple oxides of transition metals and lanthanides (see, for example, [0012]).

Art Unit: 1792

11. Claim 5: Nonninger further teaches wherein the metal oxide is preferably an yttrium stabilized zirconia ([0013]) and Bitterlich further explicitly teaches a YSZ with a cubic structure (see, for example TZ8Y, pg 676 section 2.1).
12. Claim 6: Nonninger further explicitly teaches the dispersion solvent as water (see, for example, [0020])
13. Claim 7: Mukherjee explicitly teaches a preferred solvent for a YSZ suspension as an azeotropoic mixture of methyl ethyl ketone and ethanol (pg 732).
14. Claim 9: Nonninger further teaches wherein the metal oxide powder particles have a size of between 3 nm and 100 nm (see, for example, [0026]); although Nonninger does not explicitly teach 5 nm to 5 microns; it would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated such a claimed size since in the case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).
15. Claim 10: Nonninger further teaches wherein the dispersant is chosen from ionic and non-ionic surfactants (surface active molecules) (see, for example, [0019]). Additionally, Mukherjee explicitly teaches that phosphate ester is a popular dispersant for YSZ suspensions (pg 732).
16. Claim 13: Nonninger further teaches wherein the polymer is chosen from poly(aliphatic) esters (see, for example, polyester, [0016]).
17. Claim 19: Nonninger further teaches wherein the drying is conducted at 80°C. (see, for example [0029]).

Art Unit: 1792

18. Claim 20: None of Nonninger, Mukherjee, or Bitterlich explicitly teach the duration of drying. The examiner takes official notice that it is well known in the art that the duration of drying is a result effective variable, influencing a balance between shorter processing times and complete drying and as such it would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated a drying time of from 1 min to 10 hrs since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

19. Claim 21: Nonninger further teaches wherein the calcination step is conducted at 500°C ([0029]). And alternatively, Bitterlich further teaches calcining YSZ at 650°C, 1200°C (see, for example, pg 677).

20. Claim 22: Nonninger further teaches wherein the heating rate 5°C / min (5 K / min) (see, for example, [0029]). And alternatively, Bitterlich further teaches firing YSZ at heating rates of 25°C / min and 60°C /min (see, for example, pg 677).

21. Claim 23: Nonninger further teaches wherein the calcination temperature is held for 1 hour (see, for example, [0029]). Alternatively Bitterlich further teaches a hold for 3 hours (see, for example, pg 677).

22. Claims 25 and 27: Nonninger further teaches wherein the substrate is a fully dense substrate (see, for example, steel substrate, [0029]).



Art Unit: 1792

23. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nonninger in view of Mukherjee and Bitterlich as applied to claim 1 above, and further in view of Valente et al (US patent 5,244,691, hereafter Valente)

24. Claim 14: Nonninger in view of Mukherjee and Bitterlich teach the method of claim 1, but none explicitly teaches wherein the polymer is a polymer obtainable from the reaction between hexamethylenetetramine and acetylacetone in acid medium. Valente teaches a method of depositing thin ceramic films (see, for example, abstract). Valente further teaches that it is well known in the art to use a polymer formed from a reaction between a hexamethylenetetramine and acetylacetone in an acid medium as a binding additive which aids in determining the viscosity and rheology of the coating composition (see, for example, abstract, and col 3 lines 1 – 41). Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated a polymer obtainable from the reaction between hexamethylenetetramine and acetylacetone in acid medium as the polymer in the method of Nonninger in view of Mukherjee and Bitterlich as such a polymer is well known in the art, and can predictably help to control the viscosity of the coating composition.

25. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nonninger in view of Mukherjee and Bitterlich as applied to claim 1 above, and further in view of Haruta et al (US 2003/0152704; hereafter Haruta).

26. Nonninger in view of Mukherjee and Bitterlich teach the method of claim 1, but none explicitly teach wherein the solution of at least one polymer further more contains

Art Unit: 1792

the same metals as those of the oxide powder. Haruta teaches a method of applying an oxide coating via dipcoating to a substrate surface (see, for example, abstract, [0092]). Haruta further teaches wherein the coating composition comprises a ceramic oxide (such as titanium oxide particles, see, for example, [0074], [0086]) and the addition of a halide of the same metal (such as titanium halide, which provides Ti metal, see, for example, [0080]). Haruta teaches that such an addition of metal species is well known in the art to improve coating properties such as density (see, for example [0249]-[0251]). Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have further incorporated the same metals as those of the oxide powder into the coating composition of Nonninger in view of Mukherjee and Bitterlich, as Haruta has taught that the addition of metal species has improve coating properties such as density. Nonninger in view of Mukherjee, Bitterlich, and Haruta do not explicitly teach wherein the same metals are added specifically at the polymer solution step, but it would have been obvious to one of ordinary skill in the art at the time of invention to have added the metal species to the polymer solution since the “selection of any order of mixing ingredients is *prima facie* obvious” In re Gibson, 39 F2d 975, 5 USPQ 230 (CCPA 1930) MPEP 2144.04 IV. C.

27. Claims 8, 12, and 16 -18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nonninger in view of Mukherjee and Bitterlich as applied to claim 1 above, and further in view of Lee (“Dip Coating of Alumina Films by the Sol-gel Method” J. Mater. Res. Vol. 8, No.12, Dec 1993, 3151-3157; hereafter Lee).

Art Unit: 1792

28. Claims 8, 12, and 16-18: Nonninger in view of Mukherjee and Bitterlich teach the method of claim 1, wherein Nonninger teaches the coating is applied by dipcoating ([0009]), but none explicitly teach wherein the metal oxide powder content in the initial oxide suspension of 1 to 80%, the mass content of dispersant in the initial oxide suspension of from 0.1 to 10% by weight relative to the mass of dry metal oxide powder added, the viscosity of the polymer solution is 5 mPas to 1000 mPas, to combine the polymer solution and the initial oxide suspension in a mass ratio of 0.01 to 3, nor wherein the step of removing the substrate from the final suspension is at a controlled rate of 0.1 to 100 cm/min. Lee teaches a method of forming an oxide layer onto a substrate via a dipcoating method (see, for example, abstract). Lee further teaches that it is well known in the dipcoating art that factors including oxide concentration, solution viscosity, and the rate of withdrawal will influence the final coating properties such as thickness and uniformity (see, for example, pg 3154-3155). Further, one of ordinary skill in the art would appreciate that the amount of dispersant and viscosity of the polymer solution would influence the final suspension viscosity, and wherein the mass content of each suspension and solution and their mass ratio to each other would influence the final suspension's oxide concentration. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated a metal oxide powder content in the initial ceramic suspension of 1 to 80%, a mass content of dispersant in the initial ceramic suspension of from 0.1 to 10% by weight relative to the mass of dry metal oxide powder added, a polymer solution viscosity of 5 mPas to 1000 mPas, to combine the polymer solution and the initial oxide suspension in

Art Unit: 1792

a mass ratio of 0.01 to 3, and to incorporate a controlled substrate removal rate of 0.1 to 100 cm / min since these factors are known as result effective variables, and since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

29. Claims 24, 26, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nonninger in view of Mukherjee and Bitterlich as applied to claim 1 above, and further in view of Seabaugh et al. (US 2003/0003237; hereafter Seabaugh).

30. Claims 24, 26, and 28: Nonninger in view of Mukherjee and Bitterlich teach the method of claim 1 and 27, wherein Nonninger further teaches the substrate as metal, glass, enamel or ceramic (see, for example [0023]). Nonninger further teaches wherein the coatings can serve in a variety of catalytic, electrolyte, and solar cell applications ([0002]), and that the coating composition is preferably a yttrium stabilized zirconium ([0013]). Seabaugh teaches a method of applying a YSZ coating via a wet chemistry method for a variety of electrochemical system applications (see, for example, abstract, [0002]).

31. Claim 24: Nonninger in view of Mukherjee and Bitterlich do not explicitly teach wherein the metal oxide layer and the substrate undergo a co-sintering operation. Seabaugh further teaches wherein a YSZ coating layer is applied to an un-sintered ceramic substrate (see, for example, abstract, and [0062]). Seabaugh further teaches that when co-sintering the coating and substrate cracking can be avoided and dense

Art Unit: 1792

and leak tight films can be produced (see, for example, [0014]). Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated a co-sintering operation into the method of Nonninger in view of Mukherjee and Bitterlich, as Seabaugh has taught that YSZ coating can be predictably applied to substrates via co-sintering, and since co-sintering processes help to prevent substrate / coating cracking.

32. Claim 26: Nonninger in view of Mukherjee and Bitterlich do not explicitly teach wherein the substrate is a porous substrate ranging up to 50% by volume porosity. Seabaugh teaches it is well known in the art to apply a YSZ formed by wet chemistry method to a porous substrate of a ceramic electrode material, as such an articles performs well for solid oxide fuel cell, ceramic oxygen generation system, and ceramic membrane reactor applications, and that YSZ can be predictably applied to porous substrates (see, for example, [0002], and Fig 5a-c wherein the porosity of the substrate is less than 50%). As both Seabaugh and Nonninger in view of Mukherjee and Bitterlich teach wet chemistry methods of producing YSZ coatings and Seabaugh has taught the motivation to apply YSZ coating to porous substrates to take advantage of a variety of functional applications, it would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated the porous substrate such as those taught by Seabaugh (wherein the porosity of the substrate is less than 50%) into the method of Nonninger in view of Mukherjee and Bitterlich to obtain the predictable result of forming a YSZ coating on a substrate, with the added advantage of applying the article formed

Art Unit: 1792

to serve in solid oxide fuel cell, ceramic oxygen generation system, and ceramic membrane reactor applications.

33. Claim 28: Nonninger in view of Mukherjee and Bitterlich do not explicitly teach wherein the substrate is a porous Ni-YSZ cermet substrate. Seabaugh teaches it is well known in the art to apply a YSZ formed by wet chemistry method to a porous substrate such as a of a ceramic electrode material, as such an articles performs well for solid oxide fuel cell, ceramic oxygen generation system, and ceramic membrane reactor applications, and that YSZ can be predictably applied to porous substrates such as Ni-YSZ (see, for example, [0002], [0011]). As both Seabaugh and Nonninger in view of Mukherjee and Bitterlich teach wet chemistry methods of producing YSZ coatings and Seabaugh has taught the motivation to apply YSZ coating to porous substrates, such as Ni-YSZ to take advantage of a variety of functional applications, it would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated applying the YSZ coating to porous Ni-YSZ substrate as taught by Seabaugh into the method of Nonninger in view of Mukherjee and Bitterlich as it is well known in the art to use porous Ni-YSZ cermets as substrates for YSZ coating and wherein the YSZ coated article would possess the added advantage to serve in solid oxide fuel cell applications.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATHAN H. EMPIE whose telephone number is (571)270-1886. The examiner can normally be reached on M-F, 7:00- 4:30 EST.

Art Unit: 1792

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on (571) 272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/N. H. E./  
Examiner, Art Unit 1792

/Michael Cleveland/  
Supervisory Patent Examiner, Art Unit 1792